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**COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS**

**Sub-Committee of Experts on the Transport of Dangerous Goods**
**(Fifteenth session,**
**Geneva, 29 June-10 July 1998,**
**agenda item 3 (a))**

# PACKAGINGS AND IBCs

## Rationalized approach for assigning substances or groups of substances to packing instructions or special packing provisions

**Transmitted by the Expert from Germany**

## INTRODUCTION

In analyzing the content of document ST/SG/AC.10/C.3/1997/52 (United States of America and United Kingdom) - **Use of packagings and IBCs, Packing Instructions and Special Provisions** - the Expert from Germany feels that it would be necessary to establish a rationalized approach, similar to the transport of substances in portable tanks, recently adopted by the Committee of Experts, to assign substances or groups of substances to special kinds of packagings.

**PROPOSAL**

**General parameters for liquid and solid substances and groups of substances for which special packing instructions are needed:**

**1. Principles for liquids**

Generally packing instruction P001 should be applicable to:

Liquids of packing group I of Classes or Divisions 3, 5.1, 6.1 and 8
Liquids of packing group II of Classes or Divisions 3, 4.2, 4.3, 5.1, 6.1, 8 and 9
Liquids of packing group III of Classes or Divisions 3, 4.2, 4.3, 5.1, 6.1, 8 and 9

with certain exceptions e.g.

Stabilized or inhibited substances (Hydrogen peroxide, stabilized, Hydrogen cyanide, stabilized)
Substances for which venting devices are needed including packagings with a closure by means of two devices (metal catalyst, wetted)
Substances for which in RID/ADR no letters can be assigned
Substances which bear more than one subsidiary risk, packing group I (including n.o.s.-entries)
Some articles containing liquids (e.g. Aircraft hydraulic power unit fuel tank, Aluminium borohydride contained in devices, Batteries and Cells, containing liquid Sodium)
Substances which give off small quantities of carbon dioxyde and/or nitrogen
Molten substances (substances mentioned by name in the UN-Recommendations or being transported in a molten state)
Desensitized explosives, Isocyanates, Nitromethane, Nitroglycerin solutions of Class 3
Self-reactive and related substances and Desensitized explosives of Division 4.1
Pyrophoric liquid substances of Division 4.2
Chlorosilanes, Organic metallic compounds and their solutions of Division 4.3
Certain liquid substances of packing group I of Division 5.1
Carbonyles, Isocyanates of Division 6.1
Hydrogen fluoride, Fluorides, Bromine solution, Gallium, Mercury, Hypochloride solutions of Class 8
Genetically modified micro-organisms carried in liquid deeply refrigerated nitrogen, Substances carried at elevated temperature in a liquid state

## 2. Principles for solids

Generally packing instruction P002 should be applicable to:

Solids of packing group I of Classes or Divisions 5.1, 6.1 and 8
Solids of packing group II of Classes or Divisions 4.1, 4.2, 4.3, 5.1, 6.1, 8 and 9
Solids of packing group III of Classes or Divisions 4.1, 4.2, 4.3, 5.1, 6.1, 8 and 9

with certain exceptions e.g.

substances for which in RID/ADR no letters can be assigned
Some articles containing solids (Batteries and Cells, containing solid Sodium, Batteries, dry, containing Potassium hydroxide, Lithium batteries, Lithium batteries contained in equipment
Self-reactive and related substances and Desensitized explosives of Division 4.1
Pyrophoric solid substances of Division 4.2
Genetically modified micro-organisms, Substances carried at elevated temperature in a solid state

A list of liquid and solid goods needing more stringent packing instructions or special provisions is attached as an Annex to this document.

**In the opinion of the Expert from Germany the order of coding of instructions for IBCs and Large Packagings (which should be considered in the future) should be the same as those of the Packing instructions e.g. the IBC instruction IBC01 and IBC02 or the instruction for Large Packagings LP01 and LP02 should be assigned to substances or groups of substances for which P001 and P002 is normally used; however the criteria for substances and materials which are unsuitable for transport in IBCs should be taken into account.**

## ANNEX

## LIST OF EXCEPTIONS OF GOODS NEEDING MORE STRINGENT PACKING INSTRUCTIONS OR ADDITIONAL SPECIAL PROVISIONS (CLASS OR DIVISIONS)

### Class 3

1. UN 1261 Nitromethane not allowed in removable head packagings (special packing provision)
2. UN 1921 Propyleneimine, inhibited (special packing instruction)
3. UN 2481 Ethylisocyanate (special packing instruction)
4. UN 3064 Nitroclycerin solution in alcohol (special packing instruction)
5. UN 3165 Aircraft hydraulic power unit fuel tank (special packing instruction)
6. Obligation of vent for receptacles containing preparations, which give off small quantities of carbon dioxide and/or nitrogen (special packing provison)

### Division 4.1

1. UN 1331 Matches "strike anywhere" (special packing instruction)
2. UN 2248 sulphur, molten, UN 2304 Naphthalene, molten and UN 3176 flammable solid, organic, molten, n.o.s., not allowed in packagings (special packing provision)
3. Desensitized explosives (excluding nitrated cellulose mixtures of UN 2555, UN 2556 und UN 2557) (special packing instruction)
4. Nitrated cellulose mixtures of UN 2555, UN 2556 and UN 2557 (special packing instruction)
5. Substances related to self-reactive substances (UN 2956, UN 3242, UN 3241 and UN 3251) (special packing instruction)
6. Self-reactive substances (special packing instruction)
7. Obligation of a vent for receptacles containing self-reactive liquids (UN 3221, UN 3223, UN 3225, UN 3227, UN 3229, UN 3231, UN 3233, UN 3235, UN 3237 and UN 3239) which give off small quantities of gases (special packing provision)

### Division 4.2

1. Pyrophoric liquids or solids (special packing instruction)
2. Obligation of a vent for steel drums containing UN 1378 metal catalyst, wetted (special packing provision)
3. UN 1381 Phosphorus (special packing instruction)
4. UN 2002 Celluloid, scrap and UN 2006 Plastics, nitrocellulose-based, self-heating, additionally requirement for metal packagings (special packing provision)
5. UN 2447 Phosphorus, white, molten, not allowed in packagings (special packing provision)
6. 2870 Aluminium borohydride contained in devices (special packing instruction)

7. Closure by means of two devices for receptacles for liquids having a viscosity, at 23 °C, of less than 200 mm2/s > special packing provision

**Division 4.3**

1. Chlorosilanes (UN 1183, UN 1242, UN 1295 and UN 2988) (special packing instruction)
2. Organic metallic compounds and their solutions of UN 1928 and UN 3207 and (water-reactive) liquids (UN 3129, UN 3130, UN 3148) (special packing instruction)
3. Closure by means of two devices for receptacles for liquids of UN 3130 (special packing provision)
4. UN 3292 Batteries, containing sodium and cellls containing sodium (special packing instruction)

**Division 5.1**

1. Halogenated compounds of fluorine of UN 1745 , UN 1746, UN 2495 (special packing instruction)
2. Obligation of a vent for receptacles containing hydrogen peroxide solution or mixture of UN 2014, UN 2984 or UN 3149 (special packing provision)
3. UN 2015 Hydrogen peroxide, stabilized or -aqueous solution (special packing instruction)
4. UN 2426 Ammonium nitrate, liquid not allowed in packagings (special packing provision)

**Division 6.1**

1. UN 1051 und UN 1615 Hydrogen cyanide, stabilized (special packing instruction)
2. UN 1185 Ethyleneimine, inhibited (special packing instruction)
3. UN 1259 nickel tetracarbonyl and UN 1994 Iron pentacarbonyl (special packing instruction)
4. UN 1613 and UN 3294 Hydrogen cyanide, solutions (special packing instruction)
5. UN 2480 Methyl isocyanate (special packing instruction)
6. UN 3315 chemical sample, toxic, in packagings (special packing instruction)

**Class 8**

1. UN 1052 Hydrogen fluoride, anhydrous and UN 1790 > 85 % hydrogen fluoride (special packing instruction)
2. Receptacles of inner glass, not allowed for fluorides of UN 1727, UN 1732, UN 1740,UN 1742, UN 1743, UN 1756, UN 1757, UN 1768, UN 1775, UN1776, UN 1778, UN 1782, UN 1790, UN 1811, UN 2439, UN 2817, UN 2851 (special packing provision)
3. UN 1744 Bromine and UN 1744 bromine solution (special packing instruction)
4. Articles of UN 1774 and UN 2028 (special packing instruction)

5. Permisible periode of use of packagings for UN 1786, UN 1790, UN 2031 and UN 2032 (special packing provision)
6. Obligation of a vent for receptacles containing UN 1791 hypochlorit solution (special packing provision)
7. UN 2576 Phosphorus oxybromide, molten, not allowed in packagings (special packing provision)
8. Articles of UN 2794, UN 2795, UN 2800 and UN 3028 (special packing instruction)
9. UN 2803 Galium and UN 2809 mercury (special packing instruction)

**Class 9**

1. Articles of UN 2990 and UN 3072 (special packing instruction)
2. Articles of UN 3090 and UN 3091 (special packing instruction)
3. UN 3257 Elevated temperature liquids, n.o.s., not allowed in packagings (special packing provision)
4. UN 3258 Elevated temperature solid, n.o.s. (special packing provision)
5. Articles of UN 3268 (special packing instruction)
6. For carriage of genetically modified micro-organisms in deeply refrigerated liquid nitrogen (special packing prosivion)
7. Live animals (special packing provision)

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COMMITTEE OF EXPERTS ON THE
TRANSPORT OF DANGEROUS GOODS

Sub-Committee of Experts on the
Transport of Dangerous Goods
(Fifteenth session,
Geneva, 29 June-10 July 1998,
agenda item 5(a))

# MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

## Listing and classification
## Copper sulphate, solid or solution

Transmitted by the Expert from Germany

1. Large volumes of copper sulphate and copper sulphate pentahydrate are shipped. Copper solutions are of industrial importance not only used as a basis for fungicidal or algicidal preparations.

2. Copper sulphate and copper sulphate solutions have been regulated under UN 3010 COPPER BASED PESTICIDES according to Class 6.1 criteria based on the entry "copper compounds" in the list of Common Pesticides. Based on former RID/ADR regulations for Class 6.1 item number 87(c) solutions with 20 to 100, solid mixtures with 50 to 100 percent copper sulphate had been regulated under Packing group III of Class 6.1. The comprehensive deletion of the Pesticides Table decided by this Sub-Committee in 1995 removed any citation of copper compounds from the UN Recommendations on the Transport of Dangerous Goods.

3. Deletion of entries in dangerous goods regulations, toxicological extrapolations based on human experience and data on strong toxicity to aqueous organisms are confusing industry and authorities leading to many inquiries concerning classification.

**Properties**

4. Oral LD50 values of copper sulphate between 300 and 960 mg/kg are common for the rat, but e.g. as low as 87 mg/kg in a mouse experiment. The reason for large species differences is not known mainly because the biochemical mechanism of excessive doses of copper is not well understood.

5. Several cases of accidental or suicidal ingestion, with a total of less than 500 mg copper, equivalent to less than 30 mg/kg, have been fatal for children. The fatal dose for adults is difficult to estimate because of vomiting, but it is about 140 mg/kg. The corrosive effect of large doses of copper sulphate to mucous membranes in the gastrointestinal tract leads to shock. Patients often die in shock 2 or 3 hours after ingestion, if they survive. The absorption of copper produces severe hemolysis, icterus or liver granulomas or/and renal failure. Therefore, classification of copper sulphate solutions has to be based on human experience, too.

6. Besides toxic effects to men, copper solutions show strong toxic effects on water organisms and the potential for accumulation of copper mainly in shellfish would lead to a classification of copper sulphate according to the criteria of RID/ADR and IMDG Code for environmentally hazardous substances.

7. Solutions of copper sulphate are not corrosive to iron and galvanized iron according to criteria of Class 8.

8. A Data Sheet for substances submitted to the United Nations for new or amended classification based on COPPER SULPHATE, SOLID OR SOLUTION is attached.

**Proposal**

9. Based on measurements, scientific extrapolations and practicability, the following amendment to the Recommendations is proposed:

Add to Chapter 2:

"UN 3XXX COPPER SULPHATE, SOLID or SOLUTION 6.1 ABC III"

Add special provision:

"ABC Based on human experience solid mixtures or preparation containing less than 50 percent copper sulphate and solutions of less than 25 percent copper sulphate are not subject to these Recommendations"

Add to index:

| | | |
|---|---|---|
| "Copper sulphate pentahydrate, see | 6.1 | UN 3XXX |
| Copper sulphate pentahydrate solution, see | 6.1 | UN 3XXX" |

**DATA SHEET TO BE SUBMITTED TO THE UNITED NATIONS FOR NEW OR AMENDED CLASSIFICATION OF SUBSTANCES**

Submitted by . **Germany**. . . . . Date **March 1998** . . . . . .

Supply all relevant information including sources of basic classification data. Data should relate to the product in the form to be transported. State test methods. Answer all questions - if necessary state "not known" or "not applicable" - If data is not available in the form requested, provide what is available with details. Delete inappropriate words.

**Section 1. SUBSTANCE IDENTITY**

1.1 Chemical name **COPPER SULPHATE, SOLID OR SOLUTION** . . . . . .

1.2 Chemical formula **$CuSO_4/CuSO_4 \cdot 5\ H_20$** . . . . . .

1.3 Other names/synonyms **BLUE VITRIOL, CUPRIC SULFATE** . . . . . .

1.4.1 UN number **3XXX** . . . . . 1.4.2 CAS number **7758-99-8 , 7758-98-7** . . . . . .

1.5 Proposed classification for the Recommendations

1.5.1 proper shipping name (3.1.2 */)

1.5.2 class/division **6.1** . . . . . subsidiary risk(s) . . . . . .
packing group **III** . . . . . .

1.5.3 proposed special provisions, if any **see proposal** . . . . . .

1.5.4 proposed packing method . . . . . .

**Section 2. PHYSICAL PROPERTIES (Data for solid pure substance)**

2.1 Melting point or range . . . . . °C

2.2 Boiling point or range . . . . . °C

2.3 Relative density at :

2.3.1 15 °C **2.3** . . . . . .

2.3.2 20 °C **3.6** . . . . . .

2.3.3 50 °C . . . . . .

2.4 Vapour pressure at : **(no vapour)**

2.4.1 50 °C . . . . . **kPa**

2.4.2 65 °C . . . . . **kPa**

2.5 Viscosity at 20°C**/ **(water)** . . . . . $m^2/s$

2.6 Solubility in water at 20°C **15 °C** **20.9** . g/100 ml
**0 °C** **14.3** g/100 ml

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*/ *This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.*

**/ *See definition of "liquid" in 1.2.1 of the Model Regulations on the Transport of Dangerous Goods.*

2.7 Physical state at 20°C (2.2.1.2*/) **solid/liquid/~~gas~~****/

2.8 Appearance at normal carriage temperatures, including colour and odour .....
**odorless, metallic taste, colourless (solid)** .....

2.9 Other relevant physical properties **200 -650 °C solid decomp to cupric oxide** .....
.....

**Section 3. FLAMMABILITY**

3.1 Flammable vapour **not relevant**

3.1.1 Flash point (2.3.3*/) ..... °C oc/cc

3.1.2 Is combustion sustained? (2.3.1.2*/) . yes/no

3.2 Autoignition temperature ..... °C

3.3 Flammability range (LEL/UEL) ..... %

3.4 Is the substance a flammable solid? (2.4.2 */)

3.4.1 If yes, give details .....
.....
.....

**Section 4. CHEMICAL PROPERTIES**

4.1 Does the substance require inhibition/stabilization or other treatment such as nitrogen blanket to prevent hazardous reactivity ? **~~yes~~/no**
If yes, state

4.1.1 Inhibitor/stabilizer used .....

4.1.2 Alternative method .....

4.1.3 Time effective at 55°C .....

4.1.4 Conditions rendering in ineffective .....

4.2 Is the substance an explosive according to paragraph 2.1.1.1? (2.1 */) **~~yes~~/no**

4.2.1 If yes, give details .....
.....
.....

4.3 Is the substance a desensitized explosive? (2.4.2.4 */) **~~yes~~/no**

4.3.1 If yes, give details .....
.....
.....

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*/ *This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.*

**/ *See definition of "liquid" in 1.2.1 of the Model Regulations on the Transport of Dangerous Goods.*

4.4 Is the substance a self-reactive substance? (2.4.1 */) **yes/no**

If yes, state

4.4.1 exit box of flow chart .....

What is the self accelerating decomposition temperature (SADT) for a 50 kg package? ..... °C

Is the temperature control required? (2.4.2.3.5 */) yes/no

4.4.2 proposed control temperature for a 50 kg package ..... °C

4.4.3 proposed emergency temperature for a 50 kg package ..... °C

4.5 Is the substance pyrophoric? (2.4.3 */) **yes/no**

4.5.1 If yes, give details .....
.....
.....

4.6 Is the substance liable to self-heating? (2.4.3 */) **yes/no**

4.6.1 If yes, give details .....
.....
.....

4.7 Is the substance an organic peroxide (2.5.1 */) **yes/no**

If yes state

4.7.1 exit box of flow chart .....

What is the self accelerating decomposition temperature (SADT) for a 50 kg package? ..... °C

Is the temperature control required? (2.5.3.5.1 */) yes/no

4.7.2 proposed control temperature for a 50 kg package ..... °C

4.7.3 proposed emergency temperature for a 50 kg package ..... °C

4.8 Does the substance in contact with water emit flammable gases? (2.4.4 */) **yes/no**

4.8.1 If yes give details .....
.....
.....

4.9 Does the substance have oxidizing properties (2.5.1 */) **yes/no**

4.9.1 If yes, give details .....
.....
.....

4.10 Corrosivity (2.8 */) to:

4.10.1 mild steel **pitting corrosion reported** ..... mm/year at ..... °C

4.10.2 aluminium **0.2** .. mm/year at **20 °C**

4.10.3 other packaging materials
(specify) ..... ..... mm/year at .....
..... ..... mm/year at .....

4.11 Other relevant chemical properties .....

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*/ *This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.*

**Section 5. HARMFUL BIOLOGICAL EFFECTS (Data based on copper dosage)**

5.1 LD 50, oral (2.6.2.1.1 */) **87-960** ..... mg/kg Animal species **mouse/rat** .....

5.2 LD 50, dermal (2.6.2.1.2 */) / ..... mg/kg Animal species / .....

5.3 LC 50, inhalation (2.6.2.1.3 */) / ..... mg/litre Exposure time / ..... hours
or ..... ml/m³ Animal species .....

5.4 Saturated vapour concentration at 20 °C (2.6.2.2.4.3 */) / ..... ml/m³

5.5 Skin exposure (2.8 */) results Exposure time ..... hours/minutes
Animal species .....

5.6 Other data **not corrosive - irritating for skin and eyes** .....
.....

5.7 Human experience **lowest lethal toxicity 5-50 mg/kg range** .....
.....

**Section 6. SUPPLEMENTARY INFORMATION**

6.1 Recommended emergency action

6.1.1 Fire (include suitable and unsuitable extinguishing agents)
**See IMO EMS No 6.1 - 0.2: foam, water, carbon dioxide** .....

6.1.2 Spillage **hazardous to the aquatic envionment, prevent spreading of substance; absorb in sand** .....

6.2 Is it proposed to transport the substance in :

6.2.1 Intermediate Bulk Containers (6.5*/) ? **yes/no**

6.2.2 Portable tanks (6.6*/) ? **yes/no**

If yes, give details in Sections 7 and/or 8.

**Section 7. INTERMEDIATE BULK CONTAINERS (IBCs) (only complete if yes in 2.6.2.1.1)**

7.1 Proposed type(s) .....

**Section 8. MULTIMODAL TANK TRANSPORT (only complete if yes in 2.6.2.1.2)**

8.1 Description of proposed tank (including IMO tank type if known) .....
.....

8.2 Minimum test pressure .....

8.3 Minimum shell thickness .....

8.4 Details of bottom openings, if any .....

8.5 Pressure relief arrangements .....

8.6 Degree of filling .....

8.7 Unsuitable construction materials .....

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*/ *This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.*

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**Sub-Committee of Experts on the Transport of Dangerous Goods**
**(Fifteenth session,**
**Geneva, 29 June-10 July 1998,**
**agenda item 3(b))**

# PACKAGINGS AND IBCs

## Editorial revision of Chapter 4.1

**Transmitted by the Expert from the United Kingdom**

## 1. Editorial Revision of Chapter 4.1

In the 10th Edition of the Recommendations a number of paragraphs were moved from Chapter 9 and Chapter 16 into Chapter 4.1. During a review of the new text, duplication of certain provisions for packagings and IBCs was recognised. At its Thirteenth Session in July 1997, the Sub-Committee also adopted new provisions for large packagings (ST/SG/AC.10/C.3/1997/35/ Rev.1), which has added to this problem.

This duplication is unnecessary and confusing. Packagings, including IBCs and large packagings, should be used under the same general provisions.

The Expert from the United Kingdom therefore proposes an editorial revision to Chapter 4.1.1 to combine the common text. This was first submitted to the Fourteenth Session in December 1997 as document ST/SG/AC.10/C.3/1997/62, but, in the light of comments made, that proposal was withdrawn (report ST/SG/AC.10/C.3/28, paragraph 76). This revised version takes account of written comments received since December.

In addition, in the table of examples of required marked test pressures, "Note 2" would be deleted and Notes 3 and 4 renumbered. The table was taken from the ICAO Technical Instructions. Note 2 is incomplete but in fact only deals with specific conditions for air transport. It is not intended to include this Note in Amendment 30-98 to the IMDG Code.

## 2 Consequential Changes

1 4.1.1.14 requires packagings to be manufactured under a quality assurance programme. The equivalent provision for IBCs will be found in 6.5.1.6.1 and that for large packagings is in 6.6.1.2. As quality assurance is not a packing user responsibility and to align with the other chapters, it is proposed to move 4.1.1.14 to 6.1.1.4.

2 There are cross references in 6.5 which need to be altered to reflect the new style.

3 Some minor editorial additions result from the adoption of provisions for large packagings in July 1997.

**Proposal**

**Chapter 4.1 Use of Packagings, Intermediate Bulk Containers (IBCs) and Large Packagings**

***Note 1: Packing groups***

*Dangerous goods of all classes other than Classes l, 2, and 7, divisions 5.2 and 6.2 and the self-reactive substances of division 4.1 have for packing purposes been assigned to three packing groups in accordance with the degree of danger they present, i.e.*

*Packing Group I: substances presenting high danger*
*Packing Group II: substances presenting medium danger*
*Packing Group III: substances presenting low danger*

[to align with 2.0.1.3]

*The packing group to which a substance is assigned is indicated in the Dangerous Goods List in Chapter 3.2.*

**Note 2: *Explosives, self-reactive substances and organic perioxides***

*Unless specific provision to the contrary is made in these Regulations, the packagings, including IBCs or large packagings, used for goods of Class 1, self-reactive substances of Division 4.1 and organic peroxides of Division 5.2 shall comply with the provisions for the medium danger group (Packing Group II).*

### 4.1.1 General provisions for the packing of dangerous goods, other than goods of Classes 2 or 7 or Division 6.2, in packagings, including IBCs or large packagings.

4.1.1.1 Dangerous goods shall be packed in good quality packagings, including IBCs or large packagings, which shall be strong enough to withstand the shocks and loadings normally encountered during transport, including trans-shipment between transport units and/or warehouses as well as any removal from a pallet or overpack for subsequent manual or mechanical handling. Packagings, including IBCs and large packagings, shall be constructed and closed so as to prevent any loss of contents when prepared for transport which might be caused under normal conditions of transport, by vibration, or by changes in temperature, humidity or pressure (resulting from altitude, for example). No dangerous residue shall adhere to the outside of packages, IBCs or large packagings during transport. These provisions apply to reused, reconditioned or remanufactured packagings, including IBCs or large packagings, as appropriate.
**(Ref. Doc. ST/SG/AC.10/C.3/1997/61)**

[i.e. include 4.1.2.4]

4.1.1.2 Parts of packagings, including IBCs or large packagings, which are in direct contact with dangerous goods

(a) shall not be affected or significantly weakened by those dangerous goods, and

(b) shall not cause a dangerous effect e.g. catalysing a reaction or reacting with the dangerous goods.

Where necessary, they shall be provided with a suitable inner coating or treatment.

4.1.1.3 Unless provided elsewhere in these Regulations, each packaging, including IBCs or large packagings - except inner packagings of combination packagings - shall conform to a design type successfully tested in accordance with the requirements of 6.1.5, 6.5.4 or 6.6.5, respectively.

4.1.1.4 When filling packagings, including IBCs or large packagings, with liquids, sufficient ullage (outage) shall be left to ensure that neither leakage nor permanent distortion of the packaging occurs as a result of an expansion of the liquid caused by temperatures likely to occur during transport. Unless specific requirements are prescribed in national or international rules, agreements or recommendations, liquids shall not completely fill a packaging at a temperature of 55 ∠C. However sufficient ullage shall be left in an IBC to ensure that at the mean bulk temperature of 50°C it is not filled to more than 98% of its water capacity.

[i.e. include 4.1.2.2.]

4.1.1.4.1 For air transport, packagings intended to contain liquids shall also be capable of withstanding a pressure differential without leakage as specified in the international regulations for air transport.

4.1.1.5 Inner packagings shall be packed in an outer packaging in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the outer packaging. Inner packagings that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastics materials, etc., shall be secured in outer packagings with suitable cushioning material. Any leakage of the contents shall not substantially impair the protective properties of the cushioning material or of the outer packaging.

4.1.1.6 Dangerous goods shall not be packed together in the same outer packaging, or in large packagings, with dangerous or other goods if they react dangerously with each other and cause:

(a) combustion and/or evolution of considerable heat;

(b) evolution of flammable, toxic or asphyxiant gases;

(c) the formation of corrosive substances; or

(d) the formation of unstable substances.

4.1.1.7 The closures of packagings containing wetted or diluted substances shall be such that the percentage of liquid (water, solvent or phlegmatizer) does not fall below the prescribed limits during transport.

4.1.1.7.1 Where two or more closure systems are fitted in series on an IBC, that nearest to the substance being carried shall be closed first.

[i.e include 4.1.2.3]

4.1.1.8 1/ Where pressure may develop in a package by the emission of gas from the contents (as a result of temperature increase or other cause), the packaging may be fitted with a vent, provided that the gas emitted will not cause danger on account of its toxicity, its flammability, the quantity released, etc. The vent shall be so designed that, when the packaging is in the attitude in which it is intended to be transported, leakages of liquid and the penetration of foreign matter are prevented under normal conditions of transport. Venting of the package is not permitted for air transport.

4.1.1.9 New, remanufactured or reused packagings, including IBCs or large packagings, or reconditioned packagings or repaired IBCs shall be capable of passing the tests prescribed in 6.1.5, 6.5.4 and 6.6.5, respectively. Before being filled and handed over for transport, every packaging, including IBCs or large packagings, shall be inspected to ensure that it is free from corrosion, contamination or other damage and every IBC shall be inspected with regard to the proper functioning of any service equipment. Any packaging, including IBCs or large packagings, which shows signs of reduced strength as compared with the approved design type shall no longer be used or shall be so reconditioned, or repaired, that it is able to withstand the design type tests.

[i.e. include 4.1.2.1].

4.1.1.10 Liquids shall be filled only into packagings, including IBCs, which have an appropriate resistance to the internal pressure that may develop under normal conditions of transport. Packagings or IBCs marked with the hydraulic test pressure prescribed in 6.1.3.1(d) and 6.5.2.2.1, respectively shall be filled only with a liquid having a vapour pressure:

(a) such that the total gauge pressure in the packaging (i.e. the vapour pressure of the filling substance plus the partial pressure of air or other inert gases, less 100 kPa) at 55°C, determined on the basis of a maximum degree of filling in accordance with 4.1.1.4 and a filling temperature of 15°C, will not exceed two thirds of the marked test pressure, or

(b) at 50°C less than four sevenths of the sum of the marked test pressure plus 100 kPa; or

(c) at 55°C less than two thirds of the sum of the marked test pressure plus 100 kPa.

[i.e. include 4.1.2.11.2].

Metal IBCs intended for the carriage of liquids shall not be used to carry liquids having a vapour pressure of more than 110kPa (1.1 bar) at 50°C or 130kPa (1.3 bar) at 55°C.

[i.e. include 6.5.3.1.1.(c): therefore 4.1.2.11.2 is unnecessary].

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1/ *[Note: New first sentence added at the Sub-Committee in July 1997 (see - ST/SG/AC.10/C3/26 Add 2) is unnecessary as it is already covered in 4.1.1.10]*

**EXAMPLES OF REQUIRED MARKED TEST PRESSURES FOR PACKAGINGS INCLUDING IBCs AND LARGE PACKAGINGS CALCULATED AS IN 4.1.1.10 (c)**

| UN No. | Name | Class | Packing Group | $V_{p55}$ (kPa) | $V_{p55}$ x 1.5 (kPa) | ($V_{p55}$ x 1.5) minus 100 (kPa) | Required minimum test pressure gauge under 6.1.5.5.4.(c) (kPa) | Minimum test pressure (gauge) to be marked on the packaging (kPa) |
|---|---|---|---|---|---|---|---|---|
| 2056 | Tetrahydrofuran | 3 | II | 70 | 105 | 5 | 100 | 100 |
| 2247 | n-Decane | 3 | III | 1.4 | 2.1 | -97.9 | 100 | 100 |
| 1593 | Dichloromethane | 6.1 | III | 164 | 246 | 146 | 146 | 150 |
| 1155 | Diethyl ether | 3 | I | 100 | 299 | 199 | 199 | 250 |

***Note 1:*** *For pure liquids the vapour pressure at 55 °C ($V_{p55}$) can often be obtained from scientific tables.*

***Note 2:*** *The table refers to the use of 4.1.1.10 (c) only, which means that the marked test pressure shall exceed 1.5 times the vapour pressure at 55 °C less 100 kPa. When, for example, the test pressure for n-decane is determined according to 6.1.5.5.4 (a), the minimum marked test pressure may be lower.*

***Note 3:*** *For diethyl ether the required minimum test pressure under 6.1.5.5.5 is 250 kPa.*

4.1.1.11 Empty packagings, including IBCs or large packagings, that have contained a dangerous substance shall be treated in the same manner as is required by these Regulations for a filled packaging, unless adequate measures have been taken to nullify any hazard.

[i.e. include 4.1.2.6]

4.1.1.12 2/ Every packaging, or IBC intended to contain liquids shall successfully undergo a suitable leakproofness test, and be capable of meeting the appropriate test level indicated in 6.1.5.4.3, or 6.5.4.7 for the various types of IBCs:

(a) before it is first used for transport;

(b) after remanufacturing or reconditioning of any packaging, before it is re-used for transport;

(c) after the repair of any IBC, before it is re-used for transport.

For this test the packaging, or IBC need not have its closures fitted. The inner receptacle of a composite packaging, or IBC may be tested without the outer packaging, provided the test results are not affected. This test is not necessary for inner packagings of combination packagings.

[i.e. include 4.1.2.9].

4.1.1.13 Packagings, including IBCs or large packagings, used for solids which may become liquid at temperatures likely to be encountered during transport shall also be capable of containing the substance in the liquid state.

[i.e include 4.1.2.8]

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2/ *Although this provision was adopted for large packagings, it is in fact incorrect as there is no leak test for them in the new 6.6. 4.1.1.12 is only intended for single packagings. Large packagings are combination packagings.*

[4.1.1.14 3/ Packagings shall be manufactured and tested under a quality assurance programme which satisfies the competent authority in order to ensure that each manufactured packaging meets the requirements of this Chapter.]

4.1.1.15 4/ During transport, IBCs and large packagings, shall be securely fixed or packed into the transport unit so as to prevent lateral or longitudinal movement or impact and so as to provide adequate external support.

[i.e. reproduce 4.1.2.5]

4.1.1.16 5/ *Use of salvage packagings*

4.1.1.16.1 Damaged, defective or leaking packages, or dangerous goods that have spilled or leaked may be transported in salvage packagings mentioned in 6.1.5.1.11. This does not prevent the use of a bigger size packagings of appropriate type and performance level under the conditions of 4.1.1.16.2.

4.1.1.16.2 Appropriate measures shall be taken to prevent excessive movement of the damaged or leaking packages within a salvage packaging. When the salvage packaging contains liquids, sufficient inert absorbent material shall be added to eliminate the presence of free liquid.

**4.1.2 Additional general provisions for the use of IBCs**

4.1.2.1. to 4.1.1.9

4.1.2.2. to 4.1.1.4

4.1.2.3 to 4.1.1.7

4.1.2.4 to 4.1.1.1.

4.1.2.5 to 4.1.1.15 (or 7.1.1.X)

4.1.2.6 to 4.1.1.11

4.1.2.1 When IBCs are used for the transport of liquids, with a flash point of 60.5°C (closed cup) or lower, or of powders liable to dust explosion, measures shall be taken to prevent a dangerous electrostatic discharge.

[Formerly 4.1.2.7]

4.1.2.8 to 4.1.1.13

4.1.2.9 to 4.1.1.12

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3/ *Move to a new 6.1.1.4 for packagings and 6.6.1 2 for large packagings since quality assurance concerns the manufacturer before the user and the equivalent for IBCs is already in 6.5.1.6.1. [Already noted for the reformatted IMDG Code.]*

4/ *Note: This paragraph should be moved to a new paragraph 7.1.1.X. In ST/SG/AC.10/C3/26 Add 2 the Secretary proposes that this paragraph is moved to Part 7.*

5/ *Note: If 4.1.1.14 is moved to 6.1.1.4 and 4.1.1.15 is moved to 7.1.1.X, existing 4.1.1.16 becomes 4.1.1.14.*

4.1.2.2 The periodic testing and inspection requirements for IBCs are provided in Chapter 6.5. An IBC shall not be filled and offered for transport after the date of expiry of the last periodic test required by 6.5.4.14.3, or the date of expiry of the last periodic inspection required by 6.5.1.6.4. However, an IBC filled prior to the date of expiry of the last periodic test or inspection may be transported for a period not to exceed three months beyond the date of expiry of the last periodic test or inspection. In addition, an IBC may be transported after the date of expiry of the last periodic test or inspection.

(a) After emptying but before cleaning, for purposes of performing the required test or inspection prior to refilling; and

(b) Unless otherwise approved by the competent authority, for a period not to exceed six months beyond the date of expiry of the last periodic test or inspection in order to allow the return of dangerous goods or residues for proper disposal or recycling. Reference to this exemption shall be entered in the transport document.

[Formerly 4.1.2.10]

Delete sub-heading "4.1.2.11 Additional general provisions for the use of rigid plastics and composite IBCs for liquids".

4.1.2.3 For rigid plastics IBCs and composite IBCs with plastics inner receptacles, unless otherwise approved by the competent authority, the period of use permitted for the transport of dangerous liquids shall be five years from the date of manufacture of the receptacle except where a shorter period of use is prescribed because of the nature of the liquid to be transported.

[Formerly 4.1.2.11.1]

4.1.2.11.2 to 4.1.1.10

4.1.2.4 IBCs of type 31HZ2 shall be filled to at least 80% of the volume of the outer casing and always be carried in closed transport units.

[Formerly 4.1.2.11.3 and 4.1.2.11.4].

**Consequentials**

4.1.3.5 Amend to read:

Packagings, including IBCs and large packagings, shall conform to the requirements of Chapter 6.1, 6.5 or 6.6, respectively, and shall meet the test requirements of 6.1.5, 6.5.4 or 6.6.5, respectively, for packing group II, subject to 4.1.1.13, 6.1.2.4 and 6.5.1.4.4. Packagings meeting the test criteria of packing group I may be used. To avoid unnecessary confinement metal packagings of packing group I shall not be used.

6.5.3.1.1 (c) delete second sentence [now in 4.1.1.10].

6.5.3.1.7 refers to 4.1.3.2 - Should be 4.1.1.4

6.5.4.8.4.2 refers to 4.1.2.2. - Should be 4.1.1.4

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# PACKAGINGS AND IBCs

## Definition of "Liner" for Packaging

**Transmitted by the Experts from the United Kingdom and the United States of America**

During the Working Party Meeting in Ottawa concerning Packing Instructions it was the opinion of the Working Group that there needs to be a definition of "liner" for packagings. Such a definition exists for IBCs. It was also agreed that the use of liners should be explained.

In the modal regulations there is often a requirement for a packaging to contain liners. To incorporate the packing methods into the Model Regulation it is proposed that the definition currently in 6.5.1.2 is moved to Chapter 1.2.1 and the words currently in parenthesis removed as any package or IBC could be fitted with a liner if appropriate.

The definition would read:

> "Liner means a separate tube or bag inserted into a packaging, large packaging or IBC but not forming an integral part of it, including the closures of its openings."

Add a new 4.1.1.13:

> "Packagings, large packagings and IBC's used for solids shall be siftproof or shall be provided with a liner."

Consequential Amendment:

Delete the definition of liner from 6.5.1.2.

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# MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

## Proposal to amend Chapter 5.4 documentation

**Transmitted by the Expert from Sweden and the Representative of the European Confederation of Paint, Printing Ink and Artists Colours Manufacturers Association (CEPE)**

At the fourteenth session of the Sub-Committee, papers ST/SG/AC.10/C.3/1997/58 and Informal Document INF25 were submitted by CEPE and the Expert from Sweden respectively, which sought to harmonise Dangerous Goods Transport Documentation requirements across all modes and improve their use.

The Expert from Sweden and the representative from CEPE have subsequently started work in accordance with paragraph 99 of the report of the meeting, ST/SG/AC.10/C.3/28 (page 15). Requests for information have been sent to representatives of Governments, Emergency Services, Modal Regulatory Bodies et alia, and this work is continuing. As some of the bodies contacted meet infrequently, it is anticipated that this work and the collation of the results, could take another 12-18 months to complete and enable a firm proposal for the revision of Chapter 5.4, Documentation, to be made to the Sub-Committee.

A CEFACT Working Group, the ITPWG (International Trade Procedures Working Group), at their meeting in March 1998, noted and supported the CEPE paper. It was agreed that an Ad Hoc Sub Group of the ITPWG dealing with dangerous goods would be established later this year, to examine the revision of Recommendation No. 11 of the ECE Working Party on the Facilitation of International Trade Procedures in conjunction with a future proposal from Sweden and CEPE to the Sub-Committee. It is hoped that their proposals for the revision of Recommendation No. 11 will be submitted to the Sub-Committee for their consideration.

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# MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

## Listing and classification

## Precedence of hazard characteristics
## Classification of substances that are self-reactive and oxidizing

**Transmitted by the expert form Belgium**

**Background**

1. In the UN Recommendations on the Transport of Dangerous Goods, the classification rules for self-reactive substances which also have oxidizing properties are very confusing.

2. On the one hand, it is stated in the definitions of Chapter 2.4 [alinea 2.4.2.3.1.1 (a) (ii)] that "*substances are not considered to be self-reactive substances of Division 4.1, if they are oxidizing substances according to the assignment procedure of Division 5.1*".
The most obvious interpretation of this alinea is that substances, that are self-reactive as well as oxidizing, are substances of Division 5.1.

3. On the other hand however, we have the classification rules for Division 5.1:

- paragraph 2.5.2.1.2 states that the requirements of Chapter 2.0 shall be met for oxidizing substances having other risks;
- sub-section 2.0.3 (c) (precedence of hazard characteristics) of Chapter 2.0 states that self-reactive substances of Division 4.1 are amongst the primary characteristics that always take precedence when the class of a substance, mixture or solution having more than one risk has to be determined - oxidizing substances of Division 5.1 do not have this precedence.

Thus, substances with oxidizing properties of Division 5.1 and self-reactive properties of Division 4.1 are not to be classified in Division 5.1.

4. In view of the above, it is obvious that alinea 2.4.2.3.1.1 (a) (ii) only means that substance, that are self-reactive as well as oxidizing, are not allowed for transport as substances of Division 4.1.

5. The reasons for the prohibition of alinea 2.4.2.3.1.1 (a) (ii) lie in the specific properties of these substances. These would lead to a Class 1 classification, or - in the case of instability - to a transport prohibition. These cases have already been taken care of in alinea 2.4.2.3.1.1 (a) (i).

**PROPOSAL**

The expert from Belgium proposes that alinea 2.4.2.3.1.1 (a) (ii) is deleted.

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# MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATION ON THE TRANSPORT OF DANGEROUS GOODS

## Transport of Peroxyacetic acid in IBCs and Tanks

**Transmitted by the Observer from Finland**

## 1. Introduction

The carriage of 3109, Peroxyacetic acid, Type F, stabilized, with a peroxyacetic acid concentration equal to or less than 43 % is allowed in accordance with the UN Recommendation, tenth revised edition (the list of peroxides permitted for transport in 2.5.3.2.4). In accordance with the packing instruction 521 (4.1.5.3) the transport of this substance is also permitted in IBCs of the Types 31H1, 31HA1 and 31A, provided that the concentration of the peroxiacetic acid does not exceed 17 %.

In the table "T34 Portable tank instructions" (4.2.4.2.6) many Organic peroxides , Type F liquid, with the UN number 3109 are allowed to be transported in tanks. However the figure 2.2 (b), FLOW CHART SCHEME FOR ORGANIC PEROXIDES, Exit F gives the impression that these Type F organic peroxides are not permitted for tank transport. See the asterisk on the bottom of the table. This mistake should be corrected by deleting the asterisk and the text . */

Organic peroxide formulations containing almost 40 per cent peroxyacetic acid have in laboratory tests been approved and classified as UN 3109, ORGANIC PEROXIDE, TYPE F, LIQUID. Some competent authorities in European countries have issued special licences for both the sea and the land transport of peroxyacetic acid in IBCs and in tanks under the special conditions. Until now no problems have arisen.

Since there is a need for both the sea and the land transport of Organic peroxide Type F, Liquid containing 43 % or less peroxyacetic acid in certain IBCs and in tanks, Finland proposes the following changes to the UN Recommendation:

**2. Proposals**

2.1 Intermediate Bulk Containers (IBCs)

4.1.5.3 Amend the text at the end of **PACKING INSTRUCTION 521, UN 3109, ORGANIC PEROXIDE, TYPE F, LIQUID:**

| UN No | Organic peroxide | Type of IBC 1/ | Maximum quantity (litres) | Control temperature 2/ | Emergency temperature |
|---|---|---|---|---|---|
| **3109** | **ORGANIC PEROXIDE, TYPE F, LIQUID** | | | | |
| | Peroxyacetic acid, stabilized, not more than 43 % | 31 H1<br>31 HA1<br>31A | 1500<br>1500<br>1500 | | |

**1/ See 6.5.3.4, bottom openings allowed.**
**2/ The temperatures are based on a non-insulated IBC.**

Portable tank instructions

4.2.4.2.6 In portable tank instruction T-34, add the following new entry:

**T34 PORTABLE TANK INSTRUCTION**
**This portable tank instruction applies to Division 5.2 organic peroxides. The general provisions of section 4.2.1 and the requirements of section 6.6.2 shall be met. The provisions specific to organic peroxides of Division 5.2 in 4.2.1.13 shall be met**

| UN No | Substance | Min.test pressure (bar) | Min. shell thickness (mm/ref. Steel) | Bottom opening requirements | Pressure relief requirements | Filling limits | Control temp. | Emerg. temp. |
|---|---|---|---|---|---|---|---|---|
| 3109 | PEROXYACETIC ACID, TYPE F, stabilized, ≤ 43 % | 4 | See 6.6.2.4.2 | See 6.6.2.6.3 | See 6.6.2.8.2<br>4.2.1.13.6<br>4.2.1.13.7<br>4.2.1.13.8 | See 4.2.1.13.13 | | |

Principles for classification of organic peroxides

2.5.3.3 Delete the asterisk after the text in Figure 2.2 (b), Exit F and the asterisk with the text "At present, organic peroxides may not be considered for transport in tanks."*/

*/ Note by the secretariat: This mistake has already been corrected. Refer to ST/SG/AC.10/1/Rev.10/Corr.2.

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PACKAGINGS AND IBCs

**Test requirements for plastics packagings and IBCs**

**Transmitted by the Observer of Finland**

## 1. Introduction

The fact that many materials become brittle at low temperatures also applies to plastics packagings and IBCs. Predominantly, plastics packagings and IBCs are manufactured of high density (HD) polyethylene.

In the northern areas the climatic conditions are so hard that this should be taken into account in designing and testing packagings. To check the cold resistance of certain plastics packagings the Ministry of Transport and Communications in Finland has had tested more than twenty jerrycans made of HD polyethylene and produced by various manufacturers in Europe. The drop tests carried out at different temperatures showed that those products which were broken at -40 °C also did so at -18 °C.

Thus, if the packagings are made of HD polyethylene their cold resistance is high enough also in cold circumstances. The differences in durability are based on the design and the manufacturing technology of these packagings.

However, packagings made of HD polyethylene may have some equipments e.g. closures or caps manufactured of some other plastics which are less cold resistant. Most other plastics which can be used as raw materials for packagings and IBCs do not withstand cold climate, but they become brittle. Consequently the cold resistance of all packagings and IBCs is important in the transport of dangerous goods. Finland proposes following amendments in the texts of UN-Recommendations on the Transport of Dangerous Goods:

## 2. Proposals

### 2.1. Packagings

Insert the following new texts at the end of 6.1.5.3.2 (special preparation of test samples for the drop test):

> "The climatic conditions in the country of transport may require drop test at a lower temperature than -18 °C for the plastics packagings others than those made of HD polyethylene."

Insert the following text at the end of 6.1.3.1 (marking):

> "(h) The degree of the temperature, if the drop test has been done at a lower temperature than -18 °C."

### 2.2 IBCs

Insert the following new texts after 6.5.4.9.2 (c):

> "(d) The climatic conditions in the country of transport may require drop test at a lower temperature than -18 °C for the plastics IBCs others than those made of HD polyethylene."

Move existing (d) to (e).

Insert the following text at the end of 6.5.2.1:

> "(i) The degree of the temperature, if the drop test has been done at a lower temperature than -18 °C."

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# EXPLOSIVES (CLASS 1)

## Test methods for exclusion from Class 1

## Transmitted by the Expert from Sweden

### Introduction

During the meeting of the informal working group on test 6 (c) held in Orlando, United States, Canada agreed to develop a test method for articles that could be excluded from Class 1. In the meeting of the group held in Washington (see ST/SG/AC.10/C.3/1998/10) such a proposal was presented.

The method was discussed, but no consensus was reached. Furthermore several delegations expressed their interest in such a test, but there were disagreements on various points of the proposal.

### Classification of air bags in Class 2

In spring 1998, Swedish authorities have been approached by representatives from the industry who expressed interest in having air bags re-classified from Class 1 (1.4 G and/or 1.4 S) or from Class 9 into the new UN entry in Class 2 (UN No 3353).

Since these air bags are of the new hybrid gas generator generation, but still contains certain amounts of pyrotechnical compositions, the Swedish authorities hesitate to take that decision. In our legal system an article that contains explosives can not be classified in Class 2, unless that article is formally excluded from Class 1. To make this exclusion, tests have to be made in accordance with an internationally accepted test method.

Conclusions

We see a direct need of a test method for exclusion from Class 1. This method should be made on unpackaged articles. If, during the test, no projection, fire, smoke or noise external to the device is observed and if the articles outside temperature have changed (risen) less then XX*/ °C these articles could be excluded from Class 1.

*Note: */XX °C is to be determined later.*

Sweden therefore strongly supports the idea of a new test method for determining whether an article may be excluded from Class 1.

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# MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

## Diagnostic specimens for routine screening Application of the exemption provided in Section 2.6.3.3.2

**Transmitted by the Expert from Canada**

## Background

1. In Canada the Canadian Red Cross corporation has developed a nation-wide blood collection system to supply the needs of our hospitals. To ensure that the blood provided to the hospitals is free from pathogens specimens are transported by air to various laboratories throughout the country for routine screening. Prior to 1997 these specimens were identified as diagnostic specimens

'*where a relatively low probability exists that pathogens of risk groups 2 or 3 are present. Specimens transported for the purpose of routine screening tests or initial diagnosis for other than the presence of pathogens fall within this group*,'(Paragraph 2;6.5.3 b) of the International Civil Aviation Organization Technical Instructions (ICAO TI's)).

2. Section 2;6.5.5 of the ICAO TI's provides an exemption from the provisions for infectious substances for those diagnostic specimens described in Paragraph 2;6.5.3 b) if the following conditions are met:

- the primary receptacles do not contain more than 500 ml;
- the outer packaging does not contain more than 4 L;
- the primary receptacles are leakproof;
- the outer packaging is in accordance with Packing Instruction 602, except that the design type tests provided in Part 7, Chapter 6 do not apply. However, each completed package must be capable of successfully passing the drop test described in Part 7;6.2.2, except that the height of the drop must not be less than 1.2 m; and
- the package must be marked 'Diagnostic Specimen'.

3. With the 1997 edition of the International Air Transport Association (IATA) Dangerous Goods Regulations IATA issued an interpretation on Paragraph 2;6.5.3 b) that effectively made these specimens subject to the full regulatory requirements prescribed for Infectious Substances. The IATA interpretation indicated that the words 'for other than the presence of pathogens' applied to both 'specimens for routine screening test' and 'specimens for initial diagnosis'.

4. Analysis for the presence of pathogens is precisely why the Canadian Red Cross arrange for the examination of their specimens. The application of such an interpretation would mean that the numerous daily shipments of the Canadian Red Cross, as well as those of other agencies involved in similar activities, would fall into Paragraph 2;6.5.3 a) which stipulates that they are to be transported as infectious substances, subject to the full requirements of the ICAO TI's.

5. The Canadian member raised this issue during a 1997 Working Group meeting of the ICAO Dangerous Goods Panel and at that time many members believed that the words 'for other than the presence of pathogens' were never intended to modify the words 'for the purpose of routine screening tests'. The Working Group recommended that, as the Recommendations on the Transport of Dangerous Goods Model Regulations establish the provisions in this area, it would be appropriate to have the UN Committee of Experts review the wording and make a ruling regarding the text. The Canadian member was requested to initiate such action.

Proposal

6. Remedy any potential for misinterpreting the requirements with respect to 'specimens for routine screening' by amending Paragraph 2.6.3.1.3 (b) of the Recommendations on the Transport of Dangerous Goods Model Regulations as follows:

'2.6.3.1.3 (b) Those where a relatively low probability exists that pathogens of risk groups 2 or 3 are present. **Specimens transported for the purpose of initial diagnosis for other than the presence of pathogens or specimens transported for routine screening tests fall within this Group;'**

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# EXPLOSIVE SUBSTANCES AND ARTICLES (CLASS 1)

## Comments on the report of the informal working group on UN test 6 (c), Washington, D.C., 2-6 February 1998

Transmitted by the expert from France

1. The meeting of the working group was the follow-up to its first meeting held in Orlando, Florida, United States of America, from 26 to 28 September 1996 (see document ST/SG/AC.10/R.556).

Essentially, the present description of UN test 6 (c) in the second revised edition of the Manual of Tests and Criteria is based on the 1986 first edition of the Manual, particularly with reference to the criteria for the thermal flux and projections. The reservations or comments by France in the report on the Washington meeting (see document ST/SG/AC.10/C.3/1998/10) are explained below and accompanied by proposals at the end.

2. Thermal flux

The present criterion of 4kW/m² at a distance of 15 m, with a correction of the value to correspond to a mass of 100 kg net in the case of substances, comes from studies [1] [2] on fast-burning substances which produce fireballs, such as propellants. For such substances, the use of burning time instead of a flux value does not give rise to any problem.

According to France's experience, the same is not true of certain articles, particularly when they are small, for example, illuminating charges, incendiary, smoke or tear-producing ammunition, expelling explosive charges, oil well cartridges, fireworks, igniters and igniting fuses.

In the case of such articles, when the classification is based as it is at present on the thermal flux, it is almost impossible to distinguish their individual reactions either on the flux recording or on the video recording. The determination of an overall burning time for the content of the packages or unpackaged articles has no relevance in view of the almost simultaneous reaction, in cases where this occurs, of the articles in the fire. The expert from France therefore proposes that the criterion of a thermal flux of 4kW/m² at a distance of 15 m should be maintained, as an alternative to measuring burning time. The choice of the mode of assessment - thermal flux or burning time - depends on the decision of the competent authority (paragraph 1.1.2 of the Manual).

3. Projections

3.1. 20 J limit

France proposes the use of a distance/mass-energy ratio with a scale for the number of projections, in order to deal with frequent cases in which the masses and numbers of projections differ to a large extent from present masses and numbers (paragraphs 16.6.1.4.3 (b) and (c) of the Manual). The following example illustrates the principle

The scale for the number of projections takes account of present numbers - more than 10 projections, each with mass exceeding 25 g thrown more than 50 m and/or one projection with mass exceeding 150 g thrown more than 15 m - and introduces the possibility of leaving numbers between 1 and 10 for projections with masses between 25 g and 150 g.

3.2. Live projections

According to whether these projections function or not, the working group in Orlando had accepted (see document ST/SG/AC.10/R.556, table 5) that the criteria for 1.4 S classification could be:

- functioning no projections at a distance of >5 m
- non-functioning distance < 10 m.

In Washington, the working group provisionally maintained (in square brackets) the absence of live projections functioning at a distance greater than 5 m from the fire for the 1.4 S classification of articles. However, it left aside the possibility of non-functioning live projections being thrown up to 10 m.

France opposes this position for a number of reasons:

(a) It is practically impossible to determine from the video recording where functioning small-size live projections actually function;

(b) When firefighters or emergency services fight a fire, there is no particular reason for them to stop advancing at 5 m. The distance depends rather on the individual protective equipment and the firefighting methods brought into play according to the type of intervention: ordinary, hazardous, emergency. In any case, they have to deal with live objects projected at a short distance once the fire has been put out, insofar as they participate almost as a matter of course in the first phase of decontamination of the site;

(c) According to France's experience in carrying out UN test 6 (c) on packaged articles for which a 1.4 S classification is justified, a low to a very low proportion of live articles may be projected 10 m or more from the fire. The competent authority must then determine what is acceptable or not, depending on the nature (family) of the article or the hazard represented by such a live article: cap-type primers with a few milligrams of explosive, mine detonators with approximately 1 g of explosive, cartridges for weapons with a few grams of propellant, etc.

3.3. Fiery projections

First and foremost, the present French and English versions of the Manual do not match exactly in paragraph 16.6.1.4.4 (c). The English version reads: "fiery projections emanating from the product", the product being the substance as a whole and not the article and its packaging, while the French version reads: "des projections de <u>matière</u> enflammée provenant du produit", thus excluding burning pieces of packaging.

In the opinion of the expert from France, the term "fiery projections" needs to be defined; she proposes the adoption of a definition which specifically includes the definition proposed by IGUS (see document ST/SG/AC.10/C.3/R.529).

4. Proposals

These proposals for amendments to the test procedure are made with reference to the text contained in annex 1 of the report of the Washington meeting (see document ST/SG/AC.10/C.3/1998/10).

4.1. Insert a subparagraph (d) in paragraph 16.6.1.4.3 to read:

"metallic projections, each with mass exceeding 25 g and equal to or not exceeding 150 g, are thrown more than 15 m and up to 50 m from the edge of between 1 and 10 packages or unpackaged articles, such that they give rise to a hazard equivalent to the metallic projections referred to in (b) and (c) above".

4.2. In paragraph 16.6.1.4.4 (b) of the English version only, replace "fiery projections emanating from the product" by "fiery projections of substance emanating from the product".

4.3. Paragraph 16.6.1.4.4 (b), end, add:

"(see 16.6.1.4.9: Definition of a fiery projection)".

4.4. Paragraph 16.6.1.4.4 (c), end, add:

"Alternatively, in the case of articles, the irradiance of the burning product exceeds that of the fire by more than 4 $kW/m^2$ at a distance of 15 m from the edge of the packages or unpackaged articles. The irradiance is measured over 5 seconds, during the period of maximum output".

4.5. Paragraph 16.6.1.4.5 (b), delete the proposed addition in square brackets.

4.6. Add a new paragraph 16.6.1.4.9 to read:

"Definition of a fiery projection

A fiery projection consists of exposed explosive, whether or not emanating from an explosive article, ejected from packages or non-packaged articles and continuing to burn at a specified distance, if it is liable to propagate the fire".

Notes

1. The Characterization and Evaluation of Accidental Explosions, Roger A. Strehlow and Wilfred E. Baker, Prog. Energy Combustion Sci., Vol. 2, pp. 27-60, 1976.

2. Measurement and Prediction of Heat Flux in Propellant Fires, J.P. Lucotte, 20th DOD Explosives Safety Seminar, Norfolk, VA.

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# MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

## Classification of ferrosilicon products of Division 4.3

Transmitted by the Expert from Norway

### Introduction

Ferrosilicon products with 30 - 90 % silicon are assigned to UN 1408. According to special provision 40, Ferrosilicon of 70 -90 % can be exempted provided that the competent authority is satisfied by the results of tests that dangerous gases will not be evolved.

New production methods and new formulations of Ferrosilicon products have been developed by industry. Despite having a silicon content of 30 - 70 %, these products have an evolution rate of flammable gas well below the classifying criteria. The test results presented in the annex show an evolution rate of flammable gas in the range of 0.01 - 0.16 litre per kilogram of substance per hour, which is very low compared with the classifying criteria for Division 4.3 of more than 1 litre per kilogram of substance per hour.

These test results demonstrate that a number of Ferrosilicon products have a very low degree of danger. In several dangerous goods regulations, as in land transport in Europe, in the United States of America and Australia, there is a possibility to exempt such a product if it passes the test in the UN Recommendations on the Transport of Dangerous goods, Manual of Tests and Criteria.

On this basis the DSC 3 at IMO decided to introduce a possibility to exempt Ferrosilicon products in packaged form from the requirements of the IMDG Code, by introducing the following text under "Observations" for UN 1408:

> "The provisions of this Code should not apply to a consignment of Ferrosilicon carried in packaged form if it passes the test for class 4.3 as reflected in the United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria Part III - 33.4.1.4 and is accompanied by an appropriate certificate stating that the product was correctly tested and has passed the test."

In sea transport it is important to distinguish between packaged goods and transport in bulk. Since the UN Recommendations (see paragraph 1 on page 1 of the 10. revised edition) does not include transport in bulk, it is not necessary to specifically mention that the Ferrosilicon products shall be carried in packaged form. Special provision 223 therefore should be used for such an exemption provision in the UN Recommendations.

**Proposal**

It is proposed to add special provision 223 to UN 1408, and to delete special provision 40.

Special provision 223:

If the chemical or physical properties of a substance covered by this description are such that when tested it does not meet the established defining criteria for the class or division listed in column (b1), or any other class or division, it is not subject to these Regulations.

*****

**Annex**

Tests on different ferrosilicon products according to the United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria Part III - 33.4.1.4 - Test N.5: Test method for substances which in contact with water emit flammable gases.

**Tests performed by ELKEM R&D Lab, under control of Det Norske Veritas 1997.**

| Alloy | %Si | %Mg | %Al | %Ca | %Re | %Ba | %Zr | %Sr | %Mn | Gas.eval. l/kg/h |
|---|---|---|---|---|---|---|---|---|---|---|
| REMAG | 45.95 | 3.52 | 0.5 | 0.36 | 2.13 | | | | | 0.016 |
| BJOMET 8 | 45.85 | 5.92 | 0.70 | 0.99 | 1.01 | | | | | 0.052 |
| BJOMET 11 | 45.84 | 9.70 | 0.83 | 1.0 | 1.08 | | | | | 0.108 |
| COMPACTMAG | 46.10 | 5.5 | 0.7 | 1.90 | 6.10 | | | | | 0.056 |
| BJOMET 8, fines | 45.85 | 5.92 | 0.70 | 0.99 | 1.01 | | | | | 0.157 |
| RESEED | 75.00 | 0.1 | 1.1 | 0.75 | 2.05 | | | | | 0.070 |
| ALINOC | 72,5 | | 4.0 | 1.2 | | | | | | 0.017 |
| FOUNDRISIL | 75.2 | | 1.2 | 1.2 | | 1.1 | | | | 0.032 |
| BARINOC | 74.5 | | 1.2 | 1.5 | | 2.5 | | | | 0.037 |
| FOUNDRIGRADE | 75.4 | | 1.2 | 0.7 | | | | | | 0.027 |
| INOCULIN 25 | 66.0 | | 0.9 | 1.3 | | 0.5 | 4.2 | | 3.7 | 0.050 |
| INOCULIN 80 | 74.0 | | 1.2 | 2.5 | | | 1.5 | | 0.3 | 0.064 |
| SUPERSEED 50 | 48.0 | | 0.2 | 0.03 | | | | 0.8 | | 0.012 |
| SUPERSEED 75 | 75.0 | | 035 | 0.04 | | | | 0.9 | | 0.060 |
| SUPERSEED EXTRA | 76.0 | | 0.3 | 0.09 | | | | 0.9 | | 0.073 |

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# GLOBAL HARMONIZATION OF SYSTEMS OF CLASSIFICATION AND LABELLING OF CHEMICALS

## Physical hazards
## Definition for aerosols and criteria for flammable aerosols

Transmitted by the expert from the United States of America

1. The definition for aerosols used in United States transport regulations differs from that in the UN Recommendations in several respects. The United States definition is as follows:

> "Aerosol means any non-refillable metal receptacle containing a gas compressed., liquefied or dissolved under pressure, the sole purpose of which is to expel a non poisonous (other than a Division 6.1 packing group III material) liquid, paste or powder and fitted with a self-closing release device allowing the contents to be ejected by the gas."

The significant differences are:

- the definition only allows metallic aerosol containers,
- Division 6.1 substances in packing group I or II are not allowed,
- aerosol containers filled only with a gas are not authorized to be treated as aerosols.

In transport, the effect of these restrictions is that aerosol-like containers which meet the UN definition of aerosol but which do not meet the United States definition are not eligible for treatment as limited quantities. For example, under the United States definition, aerosol containers made of glass or plastic and aerosol-like containers that are only charged with a gas, would only be subject to limited quantity provisions if their capacity was 120 ml or less.

2. Under United States regulations criteria for flammability vary according to the intent of the regulations with most regulations using a performance criteria.

3. United States transport regulations define flammable aerosols on the basis of the performance criteria provided in the ICAO Technical Instructions. The definition:

> "an aerosol is considered flammable if a test of the aerosol produces any one of the following results:
>
> 1) with the valve fully open the discharged material is capable of being ignited by a flame applied for a period of 5 seconds at 150 mm from the valve orifice and the resulting flame length in the horizontal plane exceeds 450 mm, or with any degree of valve opening the flame flashes back and burns at the valve (this test is commonly referred to as the flame projection test); or
>
> 2) with the valve fully open the discharged material when directed into an open ended vessel containing an internal ignition source causes significant propagation of flame; or
>
> 3) with the valve fully open the discharged material when directed into a closed vessel containing an internal ignition source causes an explosion or rapid burning."

4. United States consumer protection regulations use the flame projection method described above but make a distinction between flammable and extremely flammable aerosols. These definitions are as follows:

> "An aerosol is classified as extremely flammable if when tested by the flame projection method (described in above) a flashback (a flame extending back to the dispenser) is obtained at any degree of valve opening and the open cup flashpoint is less than 20 °F (-6.7 °C)."
>
> "An aerosol is classified as flammable if when tested by the flame projection method (described in above) a flame projection exceeding 18 inches is obtained at full valve opening, or flashback (a flame extending back to the dispenser) is obtained at any degree of valve opening."

5. United States workplace safety regulations use the flame projection test method as described above for classifying aerosols. They do not make a distinction between extremely flammable and flammable aerosols.

6. Based on extensive testing, the performance criteria given above have been determined to be insufficient for evaluating the fire risk associated with warehouse storage of aerosols. For purposes of storage, the National Fire Protection Association classifies flammable aerosols according to the heat of combustion of the contents. The three different classes are as follows:

| | |
|---|---|
| Class 1: | total heat of chemical combustion that is less 20 kJ/g (8,600 BTU/lb); |
| Class 2: | total heat of chemical combustion that is greater than 20 kJ/g (8,600 BTU/lb) and less than or equal to 30 kJ/g (13,000 BTU/lb); |
| Class 3: | total heat of chemical combustion that is greater than 30 kJ/g (13,000 BTU/lb). |

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# MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

**Comments and Proposals on the Document ST/SG/AC.10/C.3/1997/83 dated 29 September 1997**

**Listing and classification**
**Lithium batteries**

**Transmitted by the Expert from Germany**

## I. Comments

## I.1 Tests T.1 - T.6

The proposal submitted by the expert of the United States is based on the existing recommendations of the UN for lithium batteries. According to this proposal, large lithium-ion and lithium-polymer batteries, e.g. developed for automotive applications, are classified in class 9, provided that the tests T.1 to T.6 given under chapter 38.3 of the existing recommendations are passed. These transport tests were established for small, mostly cylindrical, consumer cells with lithium-metal electrode. Their application to large, cylindrical or prismatic lithium-ion and lithium-polymer batteries is not straightforward. Therefore, the expert from Germany hereby assesses the test procedures T.1 to T.6 with respect to the following aspects:

A) Scenario: Is the scenario relevant for the transport of large cells / batteries ?
B) Feasibility: Are the tests feasible on large cells / batteries ?
C) Specification: Is the specification complete with respect to large cells / batteries ?

**T.1. Altitude simulation, extreme temperature and short circuit**

| | Scenario | Feasibility | Specification |
|---|---|---|---|
| altitude simulation | o.k. | o.k. | o.k. |
| extreme temperature | 48h @ 75°C is not realistic | large battery has to be brought out of oven into freezer, e.g. with fork lift | transient time from highest T to lowest T not sufficient |
| short circuit | 50 mΩ may not be a short circuit for large cells | large heat capacity results in long cooling-off times | the temperature of the test area also needs to be defined |

**T.2. Vibration, shock and short circuit**

| | Scenario | Feasibility | Specification |
|---|---|---|---|
| vibration | o.k. | o.k. | o.k. |
| shock | 125 to 175g peak is not realistic | large mass results in large forces, may not be feasible | o.k. |
| short circuit | see T.1 | see T.1 | see T.1 |

**Note:** The 'shock' test requires significantly larger g loads than the application of the large batteries in the automotive field (shock tests simulating road car accidents typically range up to 40g peak).

**T.3 Vibration, shock and charge**

| | Scenario | Feasibility | Specification |
|---|---|---|---|
| vibration | see T.2 | see T.2 | see T.2 |
| shock | see T.2 | see T.2 | see T.2 |
| charge | battery assembly with reversed cell is not realistic | current should be limited to maximum charge current | o.k. |

**Note:** The large batteries are integrated assemblies from which individual cells cannot be easily removed. Reversed cells would be detected either in qualitity control at production or by the battery management system during test operation. Therefore, the test may not be relevant for the transport of large cells or batteries.

**T.4. Internal short circuit**

| | Scenario | Feasibility | Specification |
|---|---|---|---|
| internal short circuit | 6 mm rod is not adapted to larger cell sizes | crushing until voltage drops may require unrealistic forces on large cells | a) large prismatic cells should be tested in two axes b) max. force or max. deformation should be given |

**T.5. Vibration, shock and low capacity cell**

| | Scenario | Feasibility | Specification |
|---|---|---|---|
| vibration | see T.2 | see T.2 | see T.2 |
| shock | see T.2 | see T.2 | see T.2 |
| low capacity cell | o.k. | o.k. | o.k. |

**Note:** The 'low capacity cell'-test, which is done with a cell having performed 50 deep cycles, results in a minor overdischarge, because cells of the technologies under discussion usually retain about 90% of the initial capacity after 50 cycles. Since 'vibration' and 'shock' are tested on batteries in sequence T.2 and forced discharge on cells in sequence T.6, the test sequence T.5 can be omitted.

**T.6. Forced discharge**

| | Scenario | Feasibility | Specification |
|---|---|---|---|
| forced discharge | o.k. | o.k. | o.k. |

**General Remark:** Large batteries of modern technologies may be equipped with liquid- or air-cooling systems. For evaluation of transport safety, it is reasonable to assume that the cooling system does not operate during transport and therefore, the series T tests should be performed without activating these cooling systems. As these batteries may also be equipped with computerized battery management systems performing active safety functions in the battery application, the series T tests should be performed without acitvating these battery management systems.

## I.2 New Special Provision 28A to UN 3090

Page 6 of draft amendments, under proposals 11.(c): With respect to safety, it is sufficient to require cells to be new and discharged, they do not need to by uncycled. In fact, cells or batteries of the technologies under discussion usually undergo some formation cycles after assembly.

# II. Proposals

## II.1 Tests T.1 - T.6

**T.1. Altitude simulation, extreme temperature and short circuit**

| | Changes |
|---|---|
| altitude simulation | ---------- |
| extreme temperature | 48h @ **60°C / 10 minutes transient** / 6h @ -20°C |
| short circuit | 1) **resistance < 30 % of cell or battery resistance**<br>2) cell / battery @ 55°C, **room between 15°C and 25°C** |

**T.2. Vibration, shock and short circuit**

| | Changes |
|---|---|
| vibration | ---------- |
| shock | peak acceleration = **50 g**, first 3 ms = **20g** min. |
| short circuit | see T.1 |

**T.3 Vibration, shock and charge**

| | Changes |
|---|---|
| vibration | ---------- |
| shock | see T.2 |
| charge | **series resistance** adjusted such that the average current draw equals the **maximum continuous charge current** given by manufacturer |

**T.4. Internal short circuit**

| | Changes |
|---|---|
| internal short circuit | 1) diameter of rod = **50% of smallest cell dimension**<br>2) test **all axes perpendicular to terminal face**<br>(cylindrical: radial axis only, prismatic: two axes)<br>3) **maximum force = 10 kN** (equals 1 metric ton) |

**T.5. Vibration, shock and low capacity cell**

| | Changes |
|---|---|
| vibration | **delete** |
| shock | **delete** |
| low capacity cell | **delete** |

**T.6. Forced discharge**

| | Changes |
|---|---|
| forced discharge | ---------- |

**General Change to Tests T.1 to T.6:**
In the paragraph of all test descriptions headed: 'the number and condition of cells and batteries to be tested are', **add** a condition:
**x) Cells and batteries are to be tested without active cooling or battery management systems being activated.**

## II.2 New Special Provision 28A to UN 3090

Page 6 of draft amendments, under proposals 11.(c): **Delete the word 'uncycled'** .